

## Length-Weight Relationship of Some Freshwater Fish from Ngawun River, Hinthada Township, Ayeyawady Region

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### Abstract

The total number of 300 individual of freshwater fish specimens were used to assess the length-weight relationship and condition factor during the study period. The study period lasted from January to June 2023. Mean total length and weight of *Notopterus notopterus* (15.96 cm and 41.17 g), *Osteobrama belangeri* (9.33 cm and 34.88g), *Puntius chola* (5.52cm and 24.91g), *Cirrhinus prosemion* (19.08 cm and 92.88g) and *Ompok bimaculatus* (16.30 cm and 46.74g) were recorded in the present study. The high value of coefficient of determination ( $R^2$ ) was in *Notopterus notopterus*  $R^2=0.8222$ , *Osteobrama belangeri*  $R^2=0.9182$ , *Cirrhinus prosemion*  $R^2=0.733$  and *Ompok bimaculatus*  $R^2=0.7047$ . The lowest value of coefficient of determination ( $R^2$ ) was found in *Puntius chola*  $R^2=0.5121$ . During the study period, three species (negative allometric) and two species (isometric) were recorded in the Ngawun River. The condition factor of some freshwater fishes was ranged from 1.002 to 1.117 in the study site.

**Keywords:** length-weight relationship, coefficient of determination, condition factor

### Introduction

Freshwater fish are most common staple food among the population of Myanmar and neighboring countries. The favorite of this food source is due to its tasteful and nutrition cooking variety and its availability of fish species in most areas. Generally almost all species of fishes are consumed except few intoxicated species (FAO, 2001). Growth of fish usually indicated through increase in length and weight is most appropriate characteristic to determine the population analysis at a particular time (Thomas *et al.*, 2003).

Length-weight relationships of fishes which are crucial in the fisheries biology and assessments, estimate the fish's average weight with a given length category by using the mathematical relation. Length-weight relationship study is a useful index to measure the growth of individual fish or group of fishes (Haimovici and Velasco, 2000). Length-weight relationship is of great importance in fisheries investigation from the expected weight of fish or a group of as an indication of fatness or degree of well-being. This relationship is called condition factor or coefficient of condition (K). The value of 'K' close to one is considered as good in assessing the well-being state (Williams, 2000).

Ayeyawady delta is important for the richness and abundance of the inland fisheries resources. Hinthada is one of the townships of Ayeyawady Region. Ngawun River is a tributary of Ayeyawady study area flows through Hinthada Township as the Ayeyawady River, extend along Hinthada District. Ngawun River was 317 km long and connected to Ayeyawady River.

Present study was conducted to the following objectives:

- to record the total length and weight of the selected fish species in the study site

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- to calculate the length-weight relationship of the selected fish species
- to observe the value of condition factor (K) of the selected fish species

## Materials and Methods

### Study area and study sites

The present study was conducted in Ngawun River at Hinthada Township and it is located at latitudes  $17^{\circ} 37'15''$  N and longitude  $92^{\circ} 22' 25''$  E. The study site of Ywar Thit Kone village was set up to collect the fishes because it is near the bank of Ngawun River and abundant of local fishermen who caught throughout the season. It is located at  $17^{\circ} 42' 45''$  N and longitude  $95^{\circ} 12' 45''$  E and 34.54 km far from Hinthada (Figure 1).

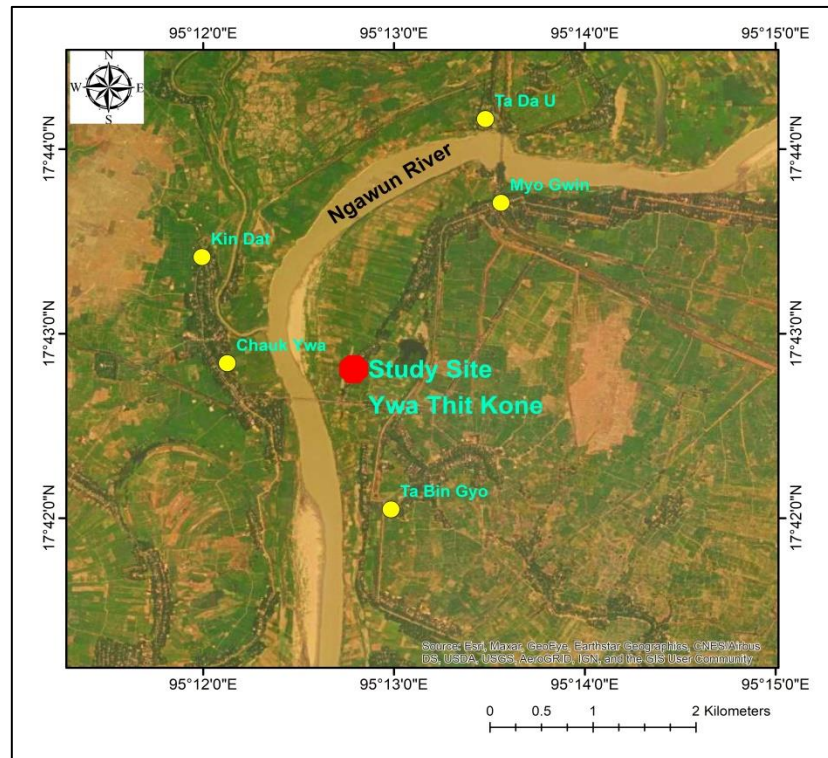


Figure1. Location map of the study area(Base map – Satellite Image)

### Study period

The study period lasted from January 2023 to June 2023.

### Identification

Identification of collected fish species was followed after Talwar and Jhingram (1991) and Jayaram (2013).

### Measurement method

Fish samples were randomly collected from the local fishermen at Ywar Thit Kone village, Ngawun River. The total number of 300 individual of freshwater fish specimens were collected in the study site. At least ten specimens for each species were measured for total length (TL) (from the tip of the snout to the end of caudal fin) and standard length (SL) (from the tip of snout to the caudal peduncle of the fish) with ruler scales. Body weight in gram was noted by digital balance.

## Data analysis

The length- weight relationship was calculated by using the least squares regression on log- transformation of the equation,  $W=a*L^b$  (FAO, 1992) and all weights (g) and total lengths (cm) were fitted to these equation.

Where, L= body length of the specimen

W= body weight of the specimen

'a' and 'b' are the intercept and slope (exponent) of the length-weight curve, respectively (King, 1996).

After logarithmic transformation of the relation ( $\log W=\log a+b \log L$ ). Where parameter 'a' and 'b' were determined via least-square linear regression where 'b' is an exponent with the value nearly always between 2 and 4 and often close to 3.

The value  $b=3$  indicates that the target species grows symmetrically or isometrically without changing body proportions. Values other than 3 indicate allometric growth: if  $b>3$ , the growth is considered as positive allometric and if  $b<3$  is negative allometric.

The value of condition factor (K) was calculated with the following equation cited by Williams (2000).

$$K=W/L^3 \times 100$$

W= weight of fish in grams

L= standard length of fish in centimeters

## Results

There were different types of fish species in this area but five fish species were found throughout the study period. Five freshwater fishes species were measured by the total length and weight during the study period (Table 1 and Plate 1). Mean total length (cm) of *Notopterus notopterus* ( $15.96 \pm 2.59$  cm), *Osteobrama belangeri* ( $9.33 \pm 1.39$  cm), *Puntius chola* ( $5.52 \pm 0.88$  cm), *Cirrhinus prosemion* ( $19.08 \pm 1.68$  cm) and *Ompok bimaculatus* ( $16.30 \pm 1.02$  cm) were observed in the study site. Mean total weight of *Notopterus notopterus* ( $41.17 \pm 18.72$  g), *Osteobrama belangeri* ( $34.88 \pm 15.14$  g), *Puntius chola* ( $24.9 \pm 5.86$  g), *Cirrhinus prosemion* ( $92.88 \pm 12.59$  g) and *Ompok bimaculatus* ( $46.74 \pm 7.08$  g) were recorded in the study period (Table 2 and Figure 2).

The regression analysis of length-weight relationship for each studied fish species was given in (Table 3 and Figure 3). In five freshwater fish species, the high values of coefficient of determination ( $R^2$ ) were observed in *Osteobrama belangeri*  $R^2 = 0.9181$  and  $R^2 = 0.8222$  of *Notopterus notopterus*. The lowest value of coefficient of determination  $R^2 = 0.5121$  was found in *Puntius chola* while the value of ( $R^2$ ) equal to 0.7 (two species) include *Cirrhinus prosemion* and *Ompok bimaculatus*.

The parabolic form of *Notopterus notopterus* ( $W=0.0091 L^{3.0069}$ ), *Osteobrama belangeri* ( $W=0.0396 L^{3.0039}$ ), *Puntius chola* ( $W=3.37115 L^{1.1044}$ ), *Cirrhinus prosemion* ( $W=2.0396 L^{1.2395}$ ) and *Ompok bimaculatus* ( $W=0.1784 L^{1.9922}$ ) were recorded in the study site. The value of (b) higher than 3 was not found positively to the allometric growth ( $b>3=PA$ ). The b value smaller than 3 was recorded in the (three species) that those species were expressed negatively to the allometric growth ( $b<3=NA$ ). In the study site, b value equal to three ( $b=3$  isometric) was found in the two species; *Notopterus notopterus* and *Osteobrama belangeri*. The value of condition factor (K) ranged

from 1.002 to 1.117. The species of *Puntius chola* was the highest value of condition factor and (K=1.117) and *Cirrhinus prosemion* (K=1.002) was the lowest value of condition factor (Table 4 and Figure 4).

Table 1. Systematic position of recorded fish species in the study site

No	Order	Family	Species	Common name	Local name
1	Osteoglossiformes	Notopteridae	<i>Notopterus notopterus</i>	Grey feather back	Nga-hphe
2	Cypriniformes	Cyprinidae	<i>Osteobrama belangeri</i>	Manipur Osteobrama	Nga-hphe-oung
3			<i>Puntius chola</i>	Swamp bard	Nga-khone-ma
4			<i>Cirrhinus prosemion</i>	Mud carp	Nga-gyin -lone
5	Siluriformes	Siluridae	<i>Ompok bimaculatus</i>	Butter catfish	Nga-nu-than

Table 2. Total length and body weight of five fish species in the study site

Species	Number (n)	Total Length	Total Weight
		Mean $\pm$ SD	Mean $\pm$ SD
<i>Notopterus notopterus</i>	60	15.96 $\pm$ 2.59	41.17 $\pm$ 18.72
<i>Osteobrama belangeri</i>	60	9.33 $\pm$ 1.39	34.88 $\pm$ 15.14
<i>Puntius chola</i>	60	5.52 $\pm$ 0.88	24.91 $\pm$ 5.86
<i>Cirrhinus prosemion</i>	60	19.08 $\pm$ 1.68	92.88 $\pm$ 12.59
<i>Ompok bimaculatus</i>	60	16.30 $\pm$ 1.02	46.74 $\pm$ 7.08

Table 3. Total length and body weight of five fish species in the study site

Species	Number (n)	Length Type	a	b	r	R <sup>2</sup>
<i>Notopterus notopterus</i>	60	TL	-2.0472	3.0069	0.9067	0.8222
<i>Osteobrama belangeri</i>	60	TL	-1.4019	3.0039	0.9582	0.9181
<i>Puntius chola</i>	60	TL	0.5695	1.1044	0.7156	0.5121
<i>Cirrhinus prosemion</i>	60	TL	0.3096	1.2935	0.8561	0.733
<i>Ompok bimaculatus</i>	60	TL	-0.7485	1.9922	0.8394	0.7047

TL= total length, a=intercept of regression line, b= slope of regression line

r = correlation coefficient R<sup>2</sup> = coefficient determination

Table 4. Fish grouping based on the value of b, slope of regression and condition factor in the study site

Species	Group	b, slope of regression	Growth pattern	W= al <sup>b</sup>	K
<i>Notopterus notopterus</i>	Isometric	3.0069	IS	W=0.0091 L <sup>3.0069</sup>	1.022
<i>Osteobrama belangeri</i>	Isometric	3.0039	IS	W=0.0396 L <sup>3.0039</sup>	1.009
<i>Puntius chola</i>	Light	1.1044	NA	W=3.7115 L <sup>1.1044</sup>	1.117
<i>Cirrhinus prosemion</i>	Light	1.2935	NA	W=2.0396 L <sup>1.2935</sup>	1.002
<i>Ompok bimaculatus</i>	Light	1.9922	NA	W=0.1784 L <sup>1.9922</sup>	1.003

IS = isometric, NA= negative allometric, b<3= light group and b=3=isometric  
K=condition factor

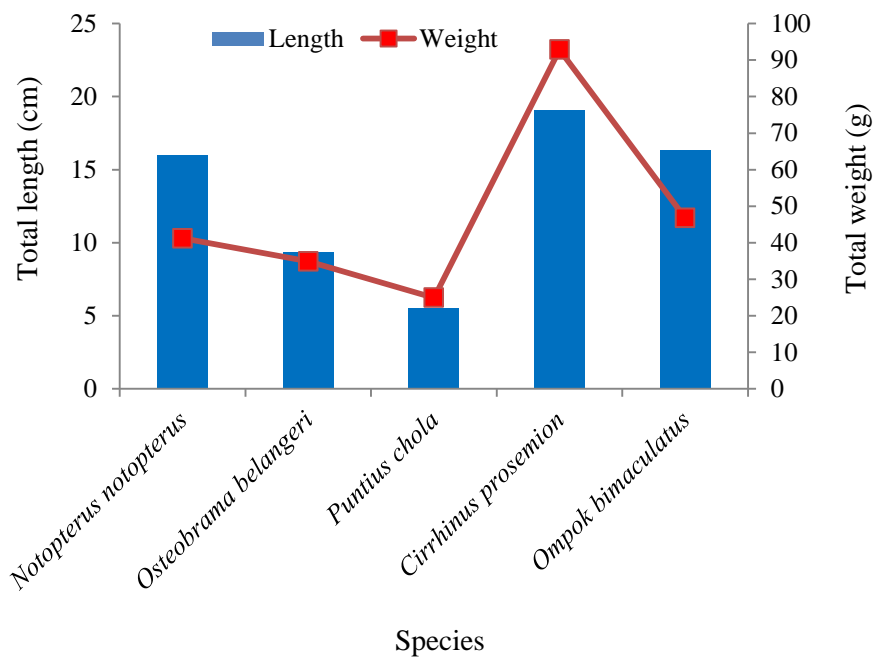
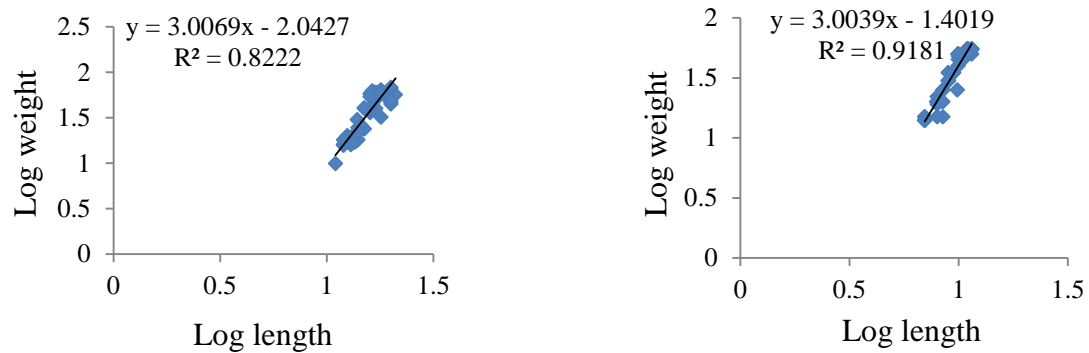
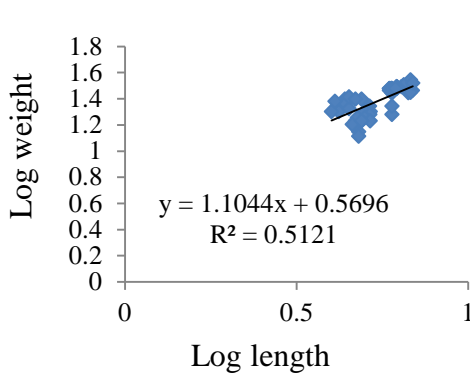


Figure 2. Total length and weight of five fish species in the study site

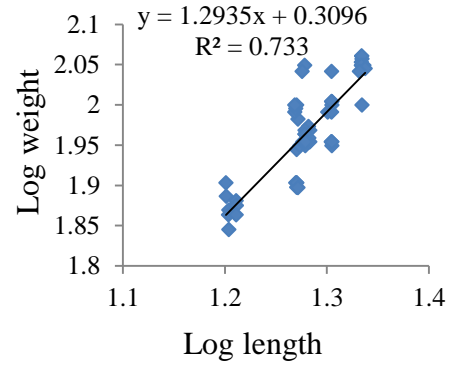


A. Linear form of *Notopterus notopterus*

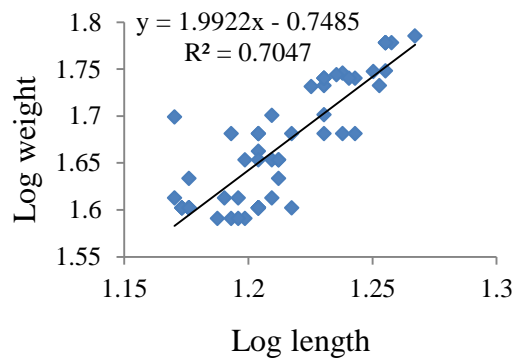
B. Linear form of *Osteobrama belangeri*



Linear form of *Puntius chola*

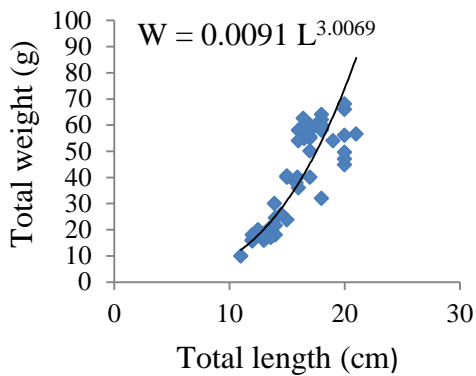


D. Linear form of *Cirrhinus prosemion*

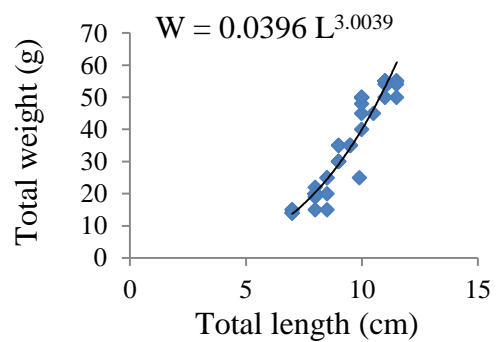


E. Linear form of *Ompok bimaculatus*

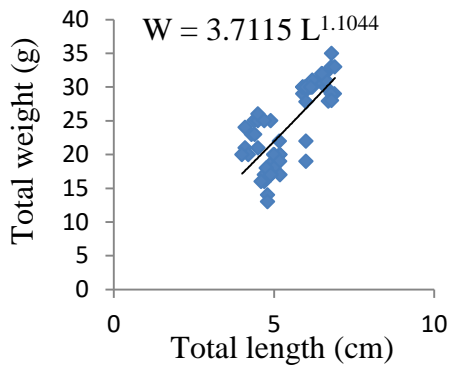
Figure 3. Length-weight relationship of five fish species in the study site



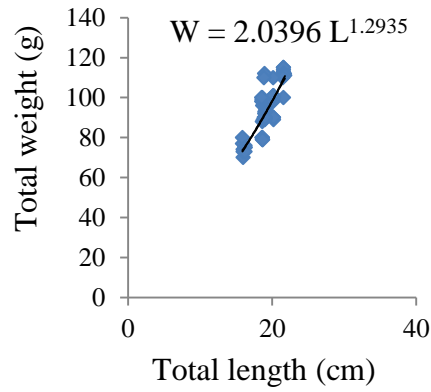
A. Parabolic form of *Notopterus notopterus*



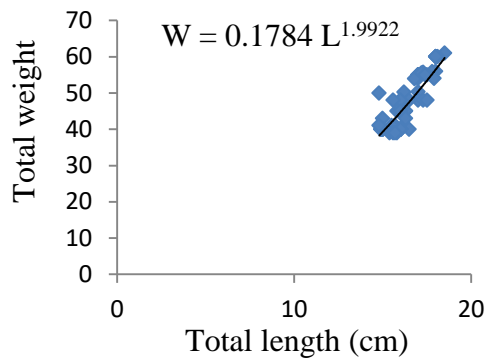
B. Parabolic form of *Osteobrama belangeri*



C. Parabolic form of *Puntius chola*



D. Parabolic form of *Cirrhinus*



E. Linear form of *Ompok bimaculatus*

Figure 4. Value of b, slope of the regression in five



A. *Notopterus notopterus*



B. *Osteobrama belangeri*



C. *Puntius chola*



D. *Cirrhinus prosemion*



E. *Ompok bimaculatus*

Plate 1. Recorded fish species in the study site

### Discussion

In the present study, *Notopterus notopterus*, *Osteobrama belangeri*, *Puntius chola*, *Cirrhinus prosemion* and *Ompok bimaculatus* from Ngawun River was consisted of length-weight relationship and condition factor.

George *et al.* (1983) observed that the coefficient of determination ( $R^2$ ) is an indicator of goodness of fit of an equation to the observed data; the close its value is to one, the better is

the fit. Khin Thidar Myint (1997) reported that the coefficient of determination  $R^2=0.94$  for *Osteobrama belangeri* in Mandalay fish Market. Hnin Nwe Hlaing (2015) recorded that  $R^2=0.91$  for *Osteobrama belangeri* from Pauk Inn, Pakoku Township. Thae Thae (2017) and Khin Yandar Myint (2022) stated that the coefficient of determination  $R^2=0.972$  and  $R^2=0.944$  for *Osteobrama belangeri*. Ei Thantar Kyaw (2021) observed that the coefficient of determination  $R^2$  was close to 'one' in *Notopterus notopterus*, *Osteobrama belangeri* and *Ompok bimaculatus* from Ayeyawady River segment. In the present study, the highest value of the coefficient of determination ( $R^2$ ) were found to be  $R^2=0.9181$  of *Osteobrama belangeri*,  $R^2=0.8222$  of *Notopterus notopterus*,  $R^2=0.733$  of *Cirrhinus prosemion* and  $R^2=0.7047$  of *Ompok bimaculatus*. The present finding was similar to the previous researcher. Therefore, the four fish species indicated to the high correlation and goodness of fit in Ngawun River, Ywar Thit Kone village, Hinthada Township. The remaining one species of *Puntius chola* was found as  $R^2=0.5121$ .

Isa *et al.* (2010) cited that values of 'b': increases, the size of the fish also increases because the fish usually grow. The changes in fish weight in general are actually greater than the changes in its length. However, the values of 'b' then becomes greater than 3 as the fish become fatter, or when the 'b' value is lower than 3, the fish is slimmer. The value b is equal to 3, the species were symmetrically or isometrically without changing body proportions.

Similarly, the present result revealed that the three fish species fell in a light group (negative allometric group) with  $b<3$  and the remaining two species grow symmetrically (isometric group) with  $b=3$ . However, the body shape of fish tends to change as the length increases.

Williams (2000) stated that the value of K close to one is considered as good in assessing the well-being state, condition values may also vary with fish age and in some species with sex. Phyu Phyu Hnin (2012) observed that the condition factor from 1.47 to 3.59 in Ayeyawady River. Khin Yandar Myint (2022) reported that the condition factor from 1 to 1.29 in Darka River. In the present study, the value of condition factor range from 1.002 to 1.117. Therefore, the fish species indicated to the fair correlation and fairly good of fit in Ngawun River.

## Conclusion

Length-weight relationship (LWR) is an important tool for adequate management of any fish species. The present study area showed the three fish species fell in a light group (negative allometric group) with  $b<3$ . The condition factor K was found range from 1.002 to 1.117. Therefore, the abundance of fish was fairly good in Ngawun River.

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